Example 3. Determine the equation of a cubic function with zeros of -2, 3 and 5 and with a *y*-intercept of -30.

Example 4. A quartic function has zeros of 2 (multiplicity of two), -1 and -6. If the function passes through the point $(1,-28)$, what must its *y*-intercept be?

Warmup 3.4B

1. What could the degree of the following polynomial function be? odd

minimum degree of 5

positive leading coefficient.

2. Determine the zeros of
$y = 3x^3 + 5x^2 - 16x - 28$ by factoring

$p(-1) = -10$ ← not a factor
$p(-2) = 0$ $x+2$ is a factor

$$\begin{array}{r|rrrr} -2 & 3 & 5 & -16 & -28 \\ & \downarrow & -6 & +2 & 28 \\ \hline & 3 & -1 & -14 & 0 \end{array}$$

$(x+2)(3x^2 - x - 14) = y$

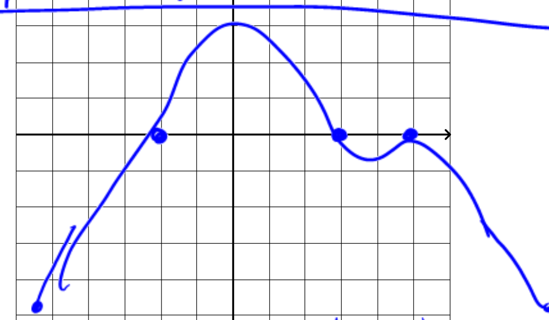
-42

$(3x-7)\dfrac{(3x+6)}{3}$

$(x+2)(3x-7)(x+2)$

4. Sketch a polynomial function with
   - degree 4
   - zeros of -2 and 3, zero of 5 with multiplicity of 2
   - a negative leading coefficient

$\boxed{y = a(x+2)(x-3)(x-5)^2 \;;\; a < 0}$



Q3→Q4 end behaviour

5. True or false

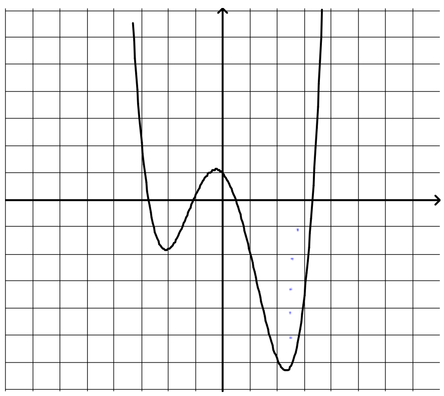
a) The degree of a polynomial indicates the number of roots the equation has.
False, it indicates the maximum.

b) The range of all polynomial functions is the Reals. F: domain is all reals.
F: even degrees have an overall max or min

c) A polynomial equation with an odd degree has at least one root.
T

d) An even degree polynomial with a positive leading coefficient has an overall maximum.
F, it has an overall minimum

3. Below is the graph of $y = .2x^4 - 2x^2 - x + 1$



e) A quartic equation could have 3 roots.
true, if multiplicty 2 on 1 root.

f) A polynomial function with degree 12 could have 16 zeros. F, it could have 12 zeros.

domain: $x \in \mathbb{R}$ or $(-\infty, \infty)$

range: $y \geq -6.3$ $[-6.3, \infty)$

Give the domain and range of the function. Use your graphing calculator if necessary.

3.4B Equations and Graphs of Polynomial Functions

horizontal stretch by 2

Example 1***: Sketching Polynomial Functions Using Transformations***

vertical stretch by 2 left 1

The function $y = x^3$ is transformed to $y = -2\left(\frac{1}{2}(x+1)\right)^3 - 1$

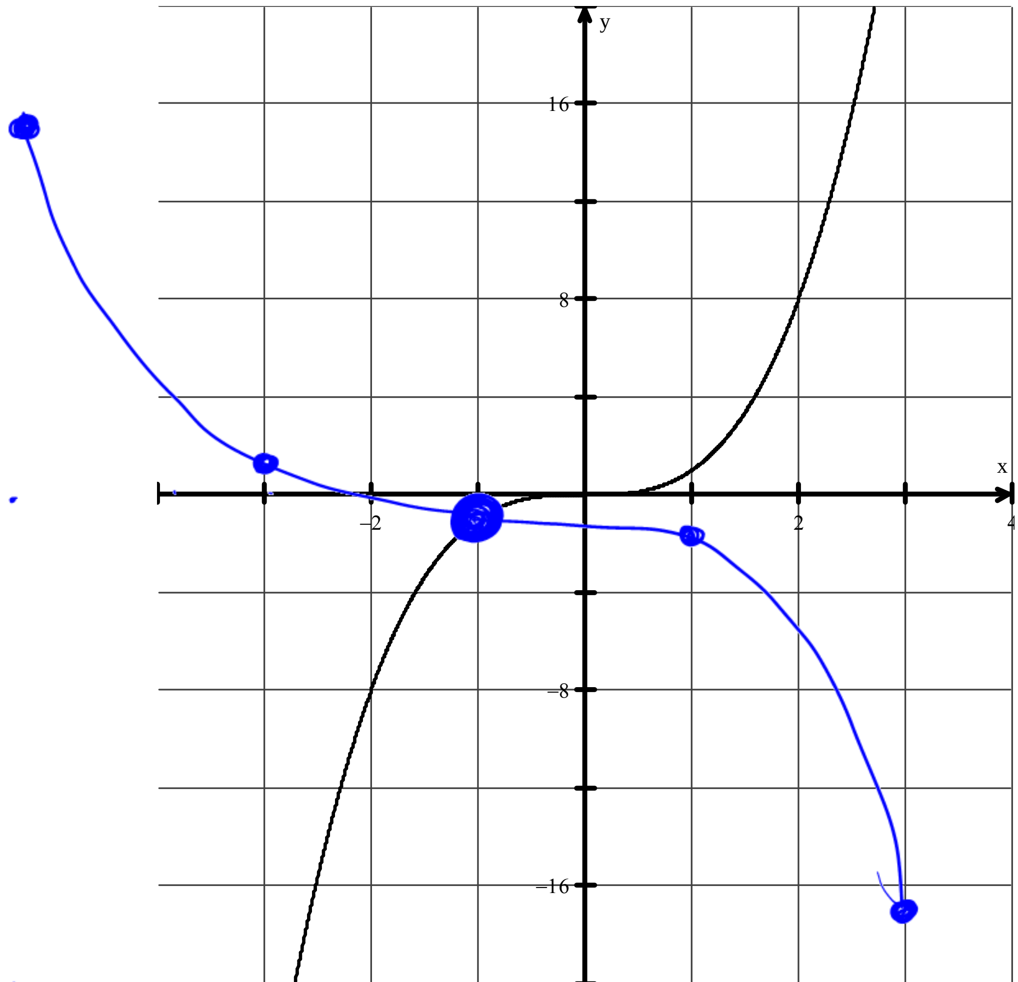
v. reflection down 1

Complete the table of values to show what happens to each point for each transformation. left 1 down 1

$y = x^3$	$y = \left(\frac{1}{2}x\right)^3$	$y = -2\left(\frac{1}{2}x\right)^3$	$y = -2\left(\frac{1}{2}(x+1)\right)^3 - 1$
$(-2, -8)$	$(-4, -8)$	$(-4, 16)$	$(-5, 15)$
$(-1, -1)$	$(-2, -1)$	$(-2, 2)$	$(-3, 1)$
$(0, 0)$	$(0, 0)$	$(0, 0)$	$(-1, -1)$
$(1, 1)$	$(2, 1)$	$(2, -2)$	$(1, -3)$
$(2, 8)$	$(4, 8)$	$(4, -16)$	$(3, -17)$

Sketch the graph of

$y = -2\left(\frac{1}{2}(x+1)\right)^3 - 1$



$V = 210$

Example 2. A rectangular block measures 5 cm by 6 cm by 7 cm. You want to reduce the volume by removing the same amount from each edge. How much must be removed from each edge to produce a block with a volume of 60 cm^2 ? (x)

a) If x represents the amount removed from each edge, what will the new dimensions of the block be?

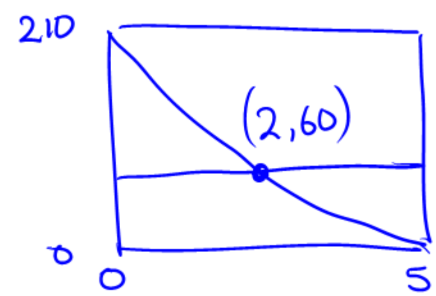
$$\underbrace{(5-x)(6-x)(7-x)}_{Y_1} = \underbrace{60}_{Y_2}$$

b) What function could be used to represent the volume of the new block? What would the domain and range of this function be?

$0 < x < 5$ ← window settings.

$0 < V < 210$

$(5-x)(6-x)(7-x) = 60$



c) How much should be removed from each edge? Determine the answer graphically and algebraically.

when $x=2$, $V=60$

so 2 cm should be removed.

$210 - 107x + 18x^2 - x^3 = 60$

$150 - 107x + 18x^2 - x^3 = 0$

$0 = x^3 - 18x^2 + 107x - 150$

$P(2) = 0$ so $x-2$ is a factor and $x=2$ is a root.